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A REVIEW ON HANDHELD DEVICES

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ABSTRACT

Today is the world of computers as every field is dependent on it. The computers have not only enhanced the efficiency of the work but offer top notch results as well. This is the reason that computers have become an important part of our lives and it is difficult to live without them. Although we consider the computers to be technological marvels, the desktop computer could do many things for us, but if we want computer like assistance as a mobile device, we need a compact hand held computer with processing power, keypad, display and a mini built-in printer. The versatility and portability of a handheld computer makes it a great potential resource. Handheld computers vary considerably in their specifications and performance. The paper focus on few basics about the hand held device which is developed in the research lab.

KEYWORDS: Handheld computer, S1C17 Microcontroller, Compiler, Embedded C.

1. INTRODUCTION

1.1 Device: In general a device is a machine designed for a purpose.

Computer: The computer is one of the most brilliant gifts of science. Computers are constantly being updated to make our lives better. In fact the computer is a wonderful electronic brain that we have come to rely on in our everyday life. The computer has proved a friend and servant of science, technology and industry. Most offices, shops, factories and industries use computers. The Internet on a computer is a storehouse of information. The computer is a boon to all. The most that any field has gained from the invention of the computers is the business field because of its nature.

Despite of rapid growth and development in computers the delivery-confirmation and billing systems have relied upon manual systems for collecting and managing data. Sorting, loading and issuing bills were systematic, but required manual data entry at several stages. The personnel at the site carry large volumes of books, files and receipts that contain all the details. The whole process was very much time consuming and confusing also for the new workers. They have to work hard to understand all those details. The cumbersome process was eliminated with the advent of hand held machine [1]. Thus in order to decrease man power and eliminate manual blunders and save time, hand held computer with processing power, keypad, display and a mini built-in printer was excellent solution.

1.2 Handheld Computer:

Any small, mobile device that provides computing and information storage and retrieval, and that can be easily carried and used, can be called a handheld computer. Often such devices are referred to as personal digital assistants or PDAs.

Handheld computers are generally small enough to fit into the palm of the hand and can be carried comfortably in a jacket pocket. Currently, the majority of handheld computers on the market are tablet designs and are operated via a stylus and touch screen, rather than a keyboard. Some handheld computers are clamshell designs that include keyboards and resemble very small portable computers.

Handheld computers, or PDAs (personal digital assistants), are becoming more popular as the world transitions into a place where people receive their news as it happens, rather than the day after it happens. Handheld computers allow the owner to take their work with them wherever they go while staying connected to the Internet. While there are several benefits to these computers, there are also some drawbacks to handhelds

Hand held computer (HHC) is an electromechanical device with limited memory required for the specific function therefore it is quite cheaper than the PDA, Palmtop and laptop [2] Hand held computer has made lot of impact on society especially in underdeveloped and developing countries in Asia and Africa.

1.3 Advantages of Handheld Computers: Handheld computers have a number of key advantages:

Hand held computer (HHC) is a portable compact-computing device. It has user interface to interact with user, it has 16-bit processor and a printer built-in. This can be carried to any field application site. This device works by downloading the application from a desktop computer and carried to the fields to use it. It loads master data from desktop, collects the data, prints the bills at customer site and uploads the data collected from customer onto the desktop computer from hand held computer. As shown in figure1. It is integrated with 36 keys keypad for input, 4X20 LCD matrix screen for display and 24-column dot matrix printer for printing. With all these features and flexible down loadable applications the embedded device HHC can be used in many applications like, on spot bill issue for electricity billings at the consumer site, stock verification in grocery, ticket issue for buses or railways etc.

Few of them are listed below:

- Flexibility
- Time is saved
- Accuracy is improved
- Customer satisfaction
- Rework is eliminated
- Waste is reduced
- Secure
- Reduces man power

1.4 Types of handheld devices:

There is a variety of sizes and shapes of handheld computer on the market designed for different kinds of use. Handheld computers are most usefully categorized in two ways:

By appearance/form factor
By operating system (OS) and functionality.

- Appearance/form factor: Handheld devices vary significantly in physical appearance or form factor. The most obvious division is between tablet and clamshell designs.

- Operating systems (OSs) and functionality: Another way to categorise handheld devices is through the different operating systems they employ and the functionality they offer. While handheld OSs perform similar functions to the OSs of their larger desktop and portable counterparts, handheld devices have a very different set of requirementsThe two most widely usedOSs for handheld devices are Palm OS and Microsoft's Windows Mobile suite of OSs..

2. LITERATURE REVIEW:

Hawkins and his team developed the Grid Pad in 1998, the first successful hand held. It was large and awkward, but it worked [3]. The churning ideas for employing this technology in very smallportable, general purpose computers led to development of latest palmtops.

3. MATERIALS AND METHODS:

3.1 Development of Handheld computer:

The primary task is to program the microcontroller S1C17T to work as a hand held computer. The detailed study of internal architecture and hardware interfaces is required to write the program applications.The micro controller S1C17 [4], member of Epson's family. It has a wide variety of interfaces, allowing connection withmultiple sensors and a wealth of pheripheral circuits such as an EDP driver , LCD controller and driver supporting low to medium level resolutions. It has RISC architecture [5] to achieve high speed orientation and low power consumption, making it ideal for mobile devices. The family includes a rich lineup of built in flash ROM products [6]. The high quality development environment and on-chip ICE function also contribute to the shotern design turn-around time. The code for the application program is written in Embedded C lan-

guage [7-9]GCC 6.1 compiler compiler generates a hex code, which has to be is burnt into S1C17. In this project we have developed device drivers for HHC and application down loadable program. HHC can be used in many applications like, on spot bill issuing, maintaining records and mobile data collections. Normally software products developed are compiled and executed on the same system but in embedded system we have cross-compilers that are, the program is developed and compiled in one system and is executed in other system. GCC6.1 [10] compiler is used as a development tool for writing device drivers as well as application programs. The code is written in embedded C [11-12] .We are making Hex file of the program which has to be downloaded

3.2 S1C17 Microcontroller:
The S1C17001 is a 16-bit MCU that features high-speed operation, low power consumption, small size, large address space, and on-chip ICE. The S1C17001 consists of an S1C17 CPU Core, a 32K-byte ROM, a 2K-byte RAM, serial interface modules (UART that supports high bit rate and IrDA 1.0, SPI and I2C) for connecting various sensor modules, 8-bit timers, 16-bit timers, a PWM & capture timer, a clock timer, a stopwatch timer, a watchdog timer and 28 GPIO ports. The S1C17001 is capable of high-speed operation (8.2 MHz) with low operating voltage (1.8 V). Its 16-bit RISC processor executes one instruction in one clock cycle. The S1C17001 also provides an on-chip ICE function that allows on-board debugging and evaluating the program by connecting the S1C17001 to the ICD Mini (S5U1C17001H) or ICD board with only three wires.

3.2.1 FEATURES:
Features of S1C17 RISC CPU:
- Includes the instruction set optimized for C language.
- Supports memory space of up to 16M bytes.
- Includes lower-power instructions (Halt and Sleep).
- Incorporates coprocessor interface that allows for expansion of product-sum/division operation

Includes Flash ROM:
- Protect functions that guard software assets.
- Self-rewriting function

User-friendly and comfortable development tools:
- On-chip debugger and highly-functional software simulator
- Software evaluation board (SVT board)

Low power consumption:
- Adopted a highly efficient power generating DC/DC converter for internal circuit operation.
- CPU clock gear function allows for low power consumption.
- Provides low power consumption equivalent to that of 8-bit microcontroller

3.3 Keypad:
The predominant interface between human and computers is the keypad or keyboard. The keypad application program must guard against the following possibilities like more than one key pressed, key pressed and held or rapid key pressed and released. The universal key characteristic is the ability to bounce. The key contacts vibrate open and closed for a number of milliseconds when the key is hit and often when is released. The key may be debounced by using proper time delays in software.

3.4 RTC (Real Time Clock):
The PCF8563 is a CMOS real-time clock/calendar optimized for low power consumption. A programmable clock output, interrupt output and voltage-low detectors are also provided. All address and data are transferred serially via a two-line bi-directional I2C-bus. Maximum bus speed is 400 Kbits/s. The built-in

3.5 EPROM:
The EPROM is a high speed, low power consumption electrically erasable and programmable read only memory organized as 131,072 S8 bits. It requires only one supply in the range of 5V+-5% in normal read mode. This provides an electrical chip erase function. word address register is incremented automatically after each written or read data byte.

3.6 Printer:
The printer used here is 24-line dot matrix printer. It consists of a motor, main solenoid (home position) and seven printer solenoids. The motor is used for the movement of the printer head, which must be enabled initially. Main solenoid must also be enabled whenever the printing starts. Initially the printer head must be brought to home position .A printer head has 7 print wires (solenoids) arranged in a vertical column and electromagnetic mechanism able to shoot the wires.

3.7 Power supply:
NiMH battery is used as the power supply for the HHC. When the battery is fully charged it contains 6v. We will get the low battery indication at 5.3 Volts. When it reaches 4.8 V it will stop working and we have to charge it completely.

3.8 Software platform to program micro controller:
When designing software for a smaller embedded system with the 8051, it is very common to develop the entire product using assembly code. With many projects, this is a feasible approach since the amount of code that must be generated is typically less than 8 kilobytes and is relatively simple in nature. The trouble with projects done with assembly code can is that they can be difficult to read and maintain, especially if they are not well commented. Additionally, the amount of code reusable from a typical assembly language project is usually very low. Use of a higher-level language like C can directly address these issues. A program written in C is easier to read than an assembly program. Since a C program possesses greater structure, it is easier to understand and maintain. Because of its modularity, a C program can better lend itself to reuse of code from project to project. The division of code into functions will force better structure of the software and lead to functions that can be taken from one project and used in another, thus reducing overall development time. A high order language such as C allows a developer to write code, which resembles a human's thought, process more closely than does the equivalent assembly code. The developer can focus more time on designing the algorithms of the system rather than having to concentrate on their individual implementation. This will greatly reduce development time and lower debugging time since the code is more understandable. By using a language like C, the programmer does not have to be intimately familiar with the architecture of the processor. This means that someone new to a given processor can also be able to develop a project and make it run, since the internals and organization of the target processor do not have to be learned. Additionally, code developed in C will be more portable to other systems than code developed in assembly. Many target processors have C compilers available, which support ANSI C.

3.9 Embedded C:
The C programming language was designed for computers, though, and not embedded systems. It does not support direct access to registers, nor does it allow for the reading and setting of single bits, two very important requirements for 8051 software. In addition, most software developers are accustomed to writing programs that will be executed by an operating system, which provides system calls, the program may use to access the hardware. However, much code for the 8051 is written for direct use on the processor, without an operating system. To support this, the Keil Tasking Compiler has added several extensions to the C language to replace what might have normally been implemented in a system call, such as the connecting of interrupt handlers. Associated Compiler Experts (ACE) announced that C language extensions have been officially adopted and approved as part of the industry specification by the ISO technical committee. The resulting efforts can be found in technical Report 18037, extensions for programming language C to support embedded processors. The Embedded C technical report specifies a range of extensions to the ISO/IEC 9899:1999 C language specification, also known as ISO C99 usually known as Embedded C.

3.10 GCC 6.1 Compiler:
The GNU Compiler Collection (GCC) is a compiler system produced by the GNU Projectsupporting various programming language. GCC is a key component of the GNU toolchain and the standard compiler for most Unix-like Operating Systems. The Free Software Foundation (FSF) distributes GCC under the GNU General Public License (GNU GPL). GCC has played an important role in the growth of free software, as both a tool and an example.

Originally named the GNU C Compiler, when it only handled the C programming language, GCC 1.0 was released in 1987. It was extended to compile C++ in December of that year. Front ends were later developed for Objective-C, Objective-C++, Fortran, Java, Ada, and Go among others.

Version 4.5 of the OpenMP specification is now supported in the C and C++ compilers a "much improved" implementation of the OpenACC 2.0 specification is also supported. By default, the current version supports gnu++14 a superset of C++14 and gnull, a superset of C11, with strict standard support also available. It also provides experimental support for C++17 and later.

GCC has been portedto a wide variety of processorarchitectures, and is widely deployed as a tool in the development of both free and proprietary software. GCC is also available for most embedded systemsincluding ARM-based; AMCC, and FreescalePower Architecture-based chips.The compiler can target a wide variety of platforms.

As well as being the official compiler of the GNU operating system, GCC has been adopted as the standard compiler by many other modern Unix-like computer operating systems, including Linux and the BSD family, although FreeBSD and macOS have moved to the LLVM system. Versions are also available for Microsoft Windows and other operating systems; GCC can compile code for Android and iOS.

3.11 Downloading code to target processor:

The final step in development environment is to down load the Hex code to the target device, which comprises of development processor and target processor. The development processor is nothing but the processor on which we write and debug our programs. This can be an ordinary PC loaded with a tasking compiler (TC) on which we can develop a C-program and convert it into an output format, which the micro controller can understand. As shown in the figure 2 the various C files are compiled/assembled and linked to generate an Obj Hex file, which is downloaded to the target processor using a device programmer. The Crosscompiler is used here assembles or compiles code on development processor (PC) for use on target processor (here on HHC). The code runs in a real time environment.

4 APPLICATIONS:

HHC used for electric billing

HHC used for water billing etc

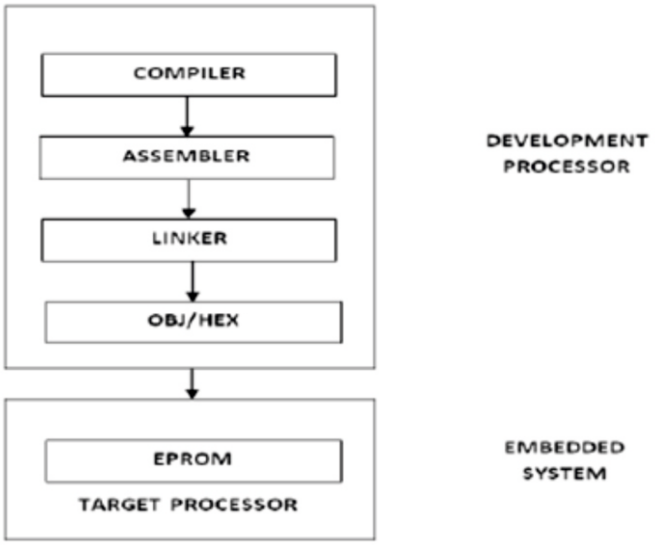
5.CONCLUSIONS:

The results of technology will be fruitful only when it reaches common man. The paper discussed the development of hand held device to collect water bills at spot. Hand held computer (HHC) is such a device that any non technical person can easily handle it. With limited memory required for the specific function it is quite cheaper. Its affordable price makes it easy to users to have it for its versatile usage. HHC are more rugged and are designed to present the user with a simple onequestion one-answer environment rather than the normal windows office automation screens. The application software is so simple that any common person could use it. Though it lacks many advance features like internet connectivity but its simplicity compliments it to become a versatile real time data collecting machine.

Tables and figures:

Hardware and software requirements:

Processor (Operating speed 30 MHz)	16 bit S1C17 microcontroller
Flash Memory	In-built (4-64 k bytes)
Random Access Memory	2048k bit RAM
Keypad	6x6alpha numeric keypad with 36 keys
Real clock time	PCF8563 (32.768 kHz
Battery	NiMH battery with 6V and 1.6 AH
Interface	RJ-16 (2Nos).
Printer	24 column DOT matrix printer
Liquid Crystal Display (LCD)	High resolution buit in feature
Operating System	Win9x, 2000, Me, XP.
Compiler	GCC6.1 Compiler
language	Assembly, C, Embedded C.



Downloading code to target processor

REFERENCES

[1] Eric G. Swedin and David L Ferro, "Computers: The Life Story of a Technology", Johns Hopkins press, Baltimore, Page 21- 31, (2005).

[2] Harry Henderson, "Encyclopedia of Computer Science and Technology", Facts on File publishers, New York (2003).

[3] Leigh Estabrooks, Inventor Archive, (2005), http://web.mit.edu/invent/iow/hawkinsj.html

[4] Architecture of S1C17 EPSON http://www.epsondevice.com/webapp/docs_ic/DownloadServlet?id=ID001656

[5] B.V.Gaonkar, "Interfacing with Microprocessors", Wiley Eastern Ltd, (1993).

[6] Muhammad Ali Mazidi and Janice Gillispie Mazidi, "8051 Microcontroller and Embedded Systems", Prentice Hall, New Jersey, (2000).

[7] Yashwant Kanitkar, "Programming with „C"", 4th edition, BPB publications, New Delhi, India, (2000).

[8] Balaguruswamy, "Programming in ANSI C", 2nd Edition, McGraw-Hill Education, New Delhi, India (1994).

[9] David E Simons, "An embedded software primer", Addison-Wesley Professional, Boston, US, (1999)

[10] GCC 6.1 Compiler manualhttps://gcc.gnu.org/onlinedocs/gcc-6.1.0/gcc.pdf

[11] John catsoulis, "Designing embedded hardware", O'Reilly media, Inc, Sebastopol, CA, (2002).

[12] Art Baker and Jerry Lozano, "The Windows 2000 Device Driver Book: A Guide for Programmers", 2 nd edition, prentice hall New Jersey, (2000).